

**Student questions: Nick Schneider colloquium on “Surprises from MAVEN at Mars: Aurora, meteor showers, and a new water loss paradigm”**

**Space Hardware**

1. What is a gimbal?
2. Given your ISP comment, what are the data speeds between MAVEN and the Rovers?
3. What is the primary limitation for extending the lifespan of the spacecraft and instrument?

**Meteor Shower**

4. What exactly causes the increase in Mg<sup>+</sup> content when in close proximity of a meteor shower?
5. During meteoric ablation, do the materials left in the atmosphere stay there and permanently affect the atmosphere or is it more of a temporary effect?
6. After an excess of Magnesium (or any element) is given to the atmosphere of a planet like Mars, what happens to the excess Magnesium?
7. Data on comet flyby was incredible. What other exotic events are you expecting from MAVEN?

**Magnetic Fields**

8. Since water was observed to have been on Mars in the past is there any biological fossil evidence found like bacteria and such small organisms?
9. Does the patchy magnetic field of present day Mars deflect the Solar Wind?
10. What is believed to be the reason/reasons for the core of Mars cooling?
11. How does the global aurora effect the colonization of Mars?
12. Did the scientific community not know aurora could happen without magnetic fields until this data was gathered, or was it hypothesized but not observed yet?
13. About how many years ago did Mars cool and loses its magnetic field?
14. What process caused localized magnetic fields to be locked in lava fields?
15. What causes a magnetic field like aurora to have color?
16. Can we expect to see proton auroras on gas giants whose atmospheres are mostly H?

**Atmospheric Evolution**

17. Why is Mars environment so different from Earth's when the two planets are so similar?
18. Can you tell if Hydrogen atoms are preferentially liberated over deuterium atoms?
19. Can you estimate the total amount of water that Mars once had by quantifying H loss?
20. Why did the MAVEN team think that it was impossible for Mars to lose so much atmosphere via solar wind before the mission?
21. What was the rationale for some of your colleagues a wetter/hotter prior atmosphere could not have escaped into space?
22. Does hydrogen escape on icy moons such as Europa or Enceladus, or does the magnetic field from Jupiter and Saturn protect them from the leeching process?
23. Is loss of atmosphere seen in other planets in our solar system?
24. You talked about the hydrogen proton escaping via H<sub>2</sub>O then breaking down into hydrogen protons and then completing the "escape"; what happens to the oxygen?